

*Goddard Information Science and Technology Colloquium*

# ***Measuring Information Productivity***

Paul A. Strassmann, Acting NASA CIO, September 18, 2002

## What is Productivity?

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

## Example of Productivity Gain Calculation – The CEO View

	Period B	Period A	% Changes
Revenue	\$12,000,000	\$10,000,000	+ 20%
Employment*	80	100	- 20%
Productivity (Revenue/Employee)	\$150,000	\$100,000	+ 50%

**\* 20 employees outsourced**

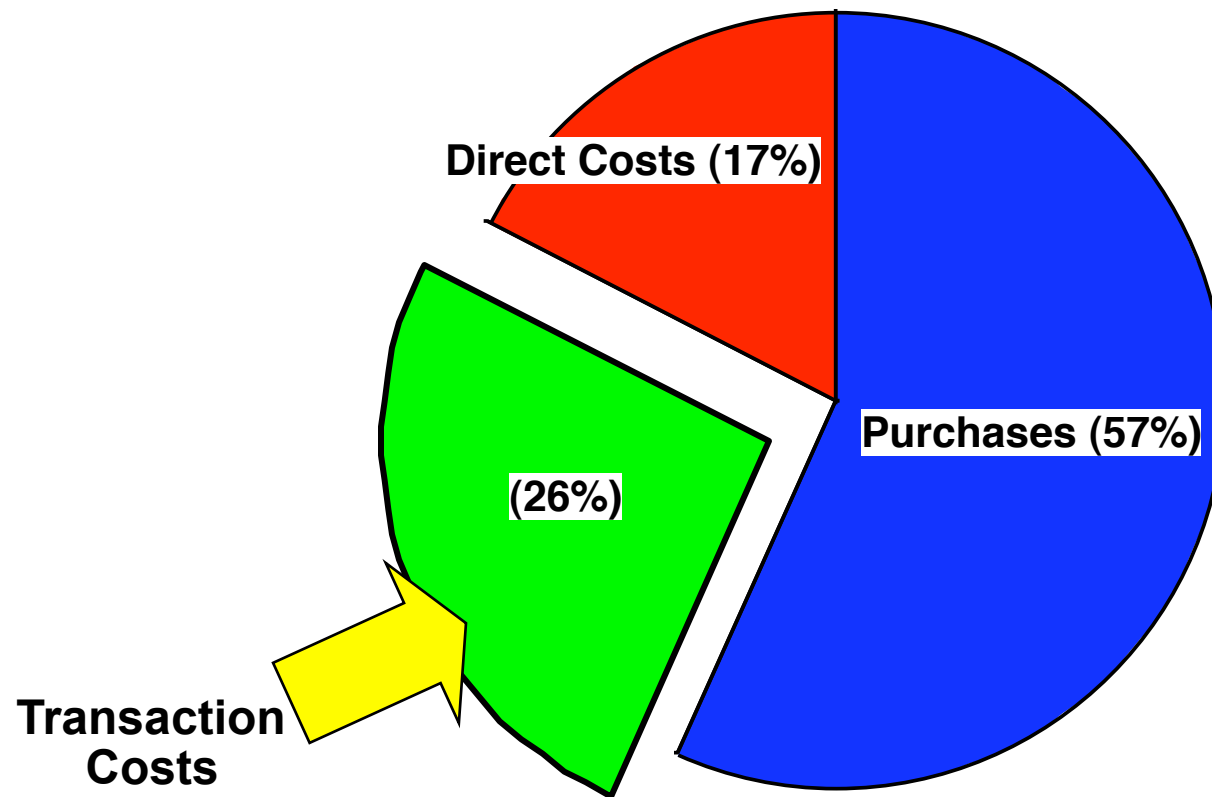
## Example of Productivity Gain Calculation – The CFO View

	Period B	Period A	Productivity Gain		
<b>Revenue</b>	\$12,000,000	\$10,000,000		20,000	
<b>Purchases</b>	\$6,000,000	\$4,000,000		20,000	
<b>Value-Added</b>	\$6,000,000	\$6,000,000		0,000	
<b>Net Assets Employed</b>	\$7,000,000	\$5,000,000		20,000	
<b>Cost of Capital</b>	9.0%	7.0%		2.0%	
<b>Economic Value-Added</b>	\$5,370,000	\$5,650,000		280,000	
<b>Employment</b>	80	100		20,000	
<b>Productivity (Economic Value-Added/Employee)</b>	\$67,125	\$56,500	19%		
<b>Productivity (Economic Value-Added/Employee)</b>			\$67,125	\$56,500	

# A Theory of Information Productivity

## An Information Management View

# Cost Structure of a U.S. Manufacturing Corporation



## Transaction Costs

- **Organization of Employees and Users**
- **Information Processing**
- **Coordination of Suppliers, Costs of Acquisition**
- **Motivation of Customers**
- **Managing Distributors**
- **Compliance with Regulations**
- **Satisfying Shareholders and Lenders**
- **Fees, commissions, tolls and taxes**
- **Research and development**

## Accounting Treatment of Transaction Costs

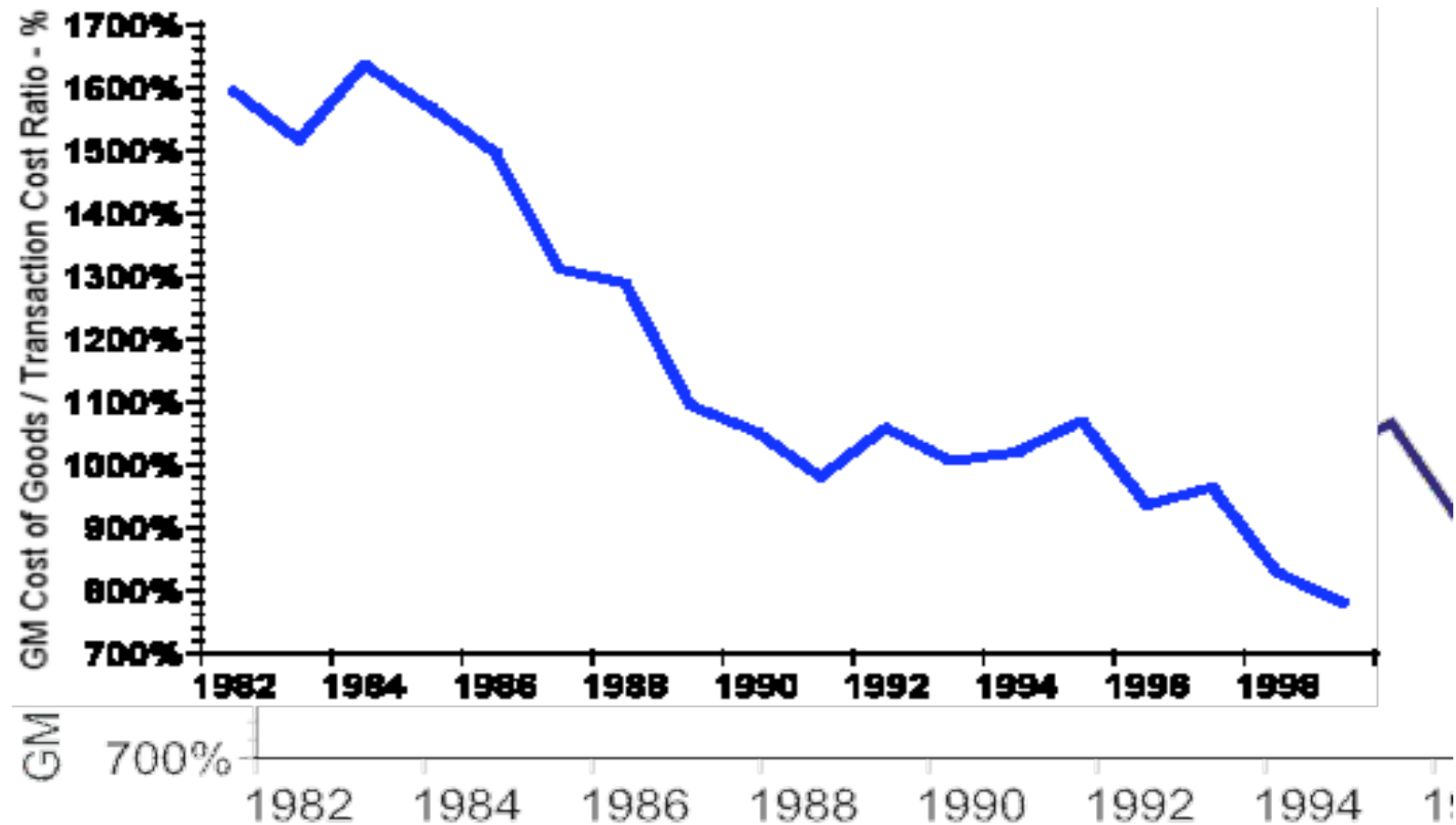
- **Sales, General & Administrative Costs**
  - Marketing**
  - Sales people**
  - Management**
  - Advertising**
  - Training**
  - I.T. Costs**
- **Research and Development Costs**
- **Reported in audited financial statements**



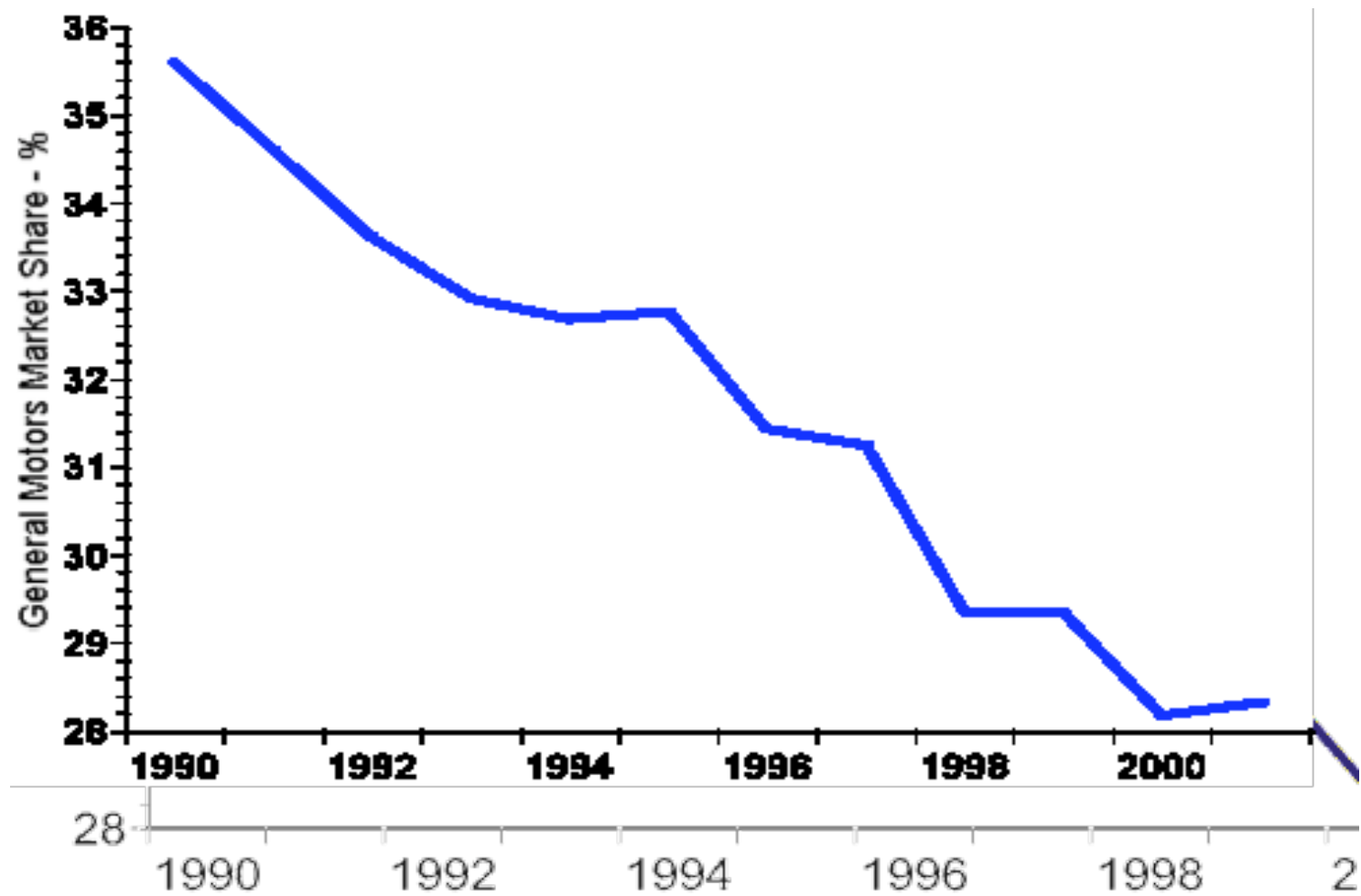
## Illustrative Case: 1998 General Motors

	\$000s	% of Revenues	
Revenues	\$161,315,000	100.0%	← Transactions
Purchases	\$87,000,000	53.9%	
Direct Costs	\$31,788,000	19.7%	
<b>SG&amp;A + R&amp;D</b>	<b>\$17,330,000</b>	<b>10.7%</b>	← Information Transaction Costs
Depreciation	\$11,978,000	7.4%	
Other Operating Expenses	\$8,800,000	5.5%	
Taxes	\$1,463,000	0.9%	
Net Income	\$2,956,000	1.8%	

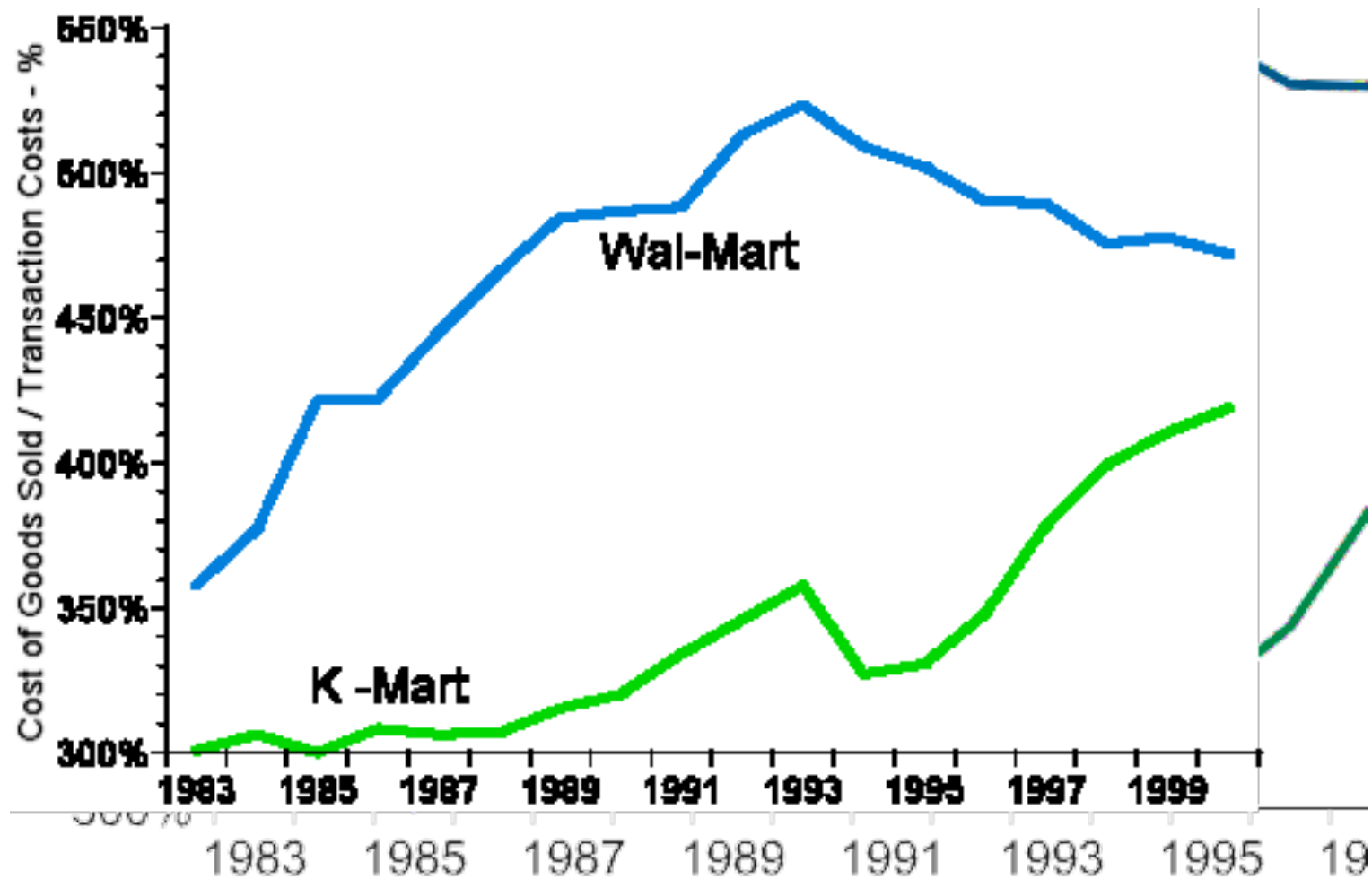
## GM Cost of Goods Delivered per Transaction \$'s Declined



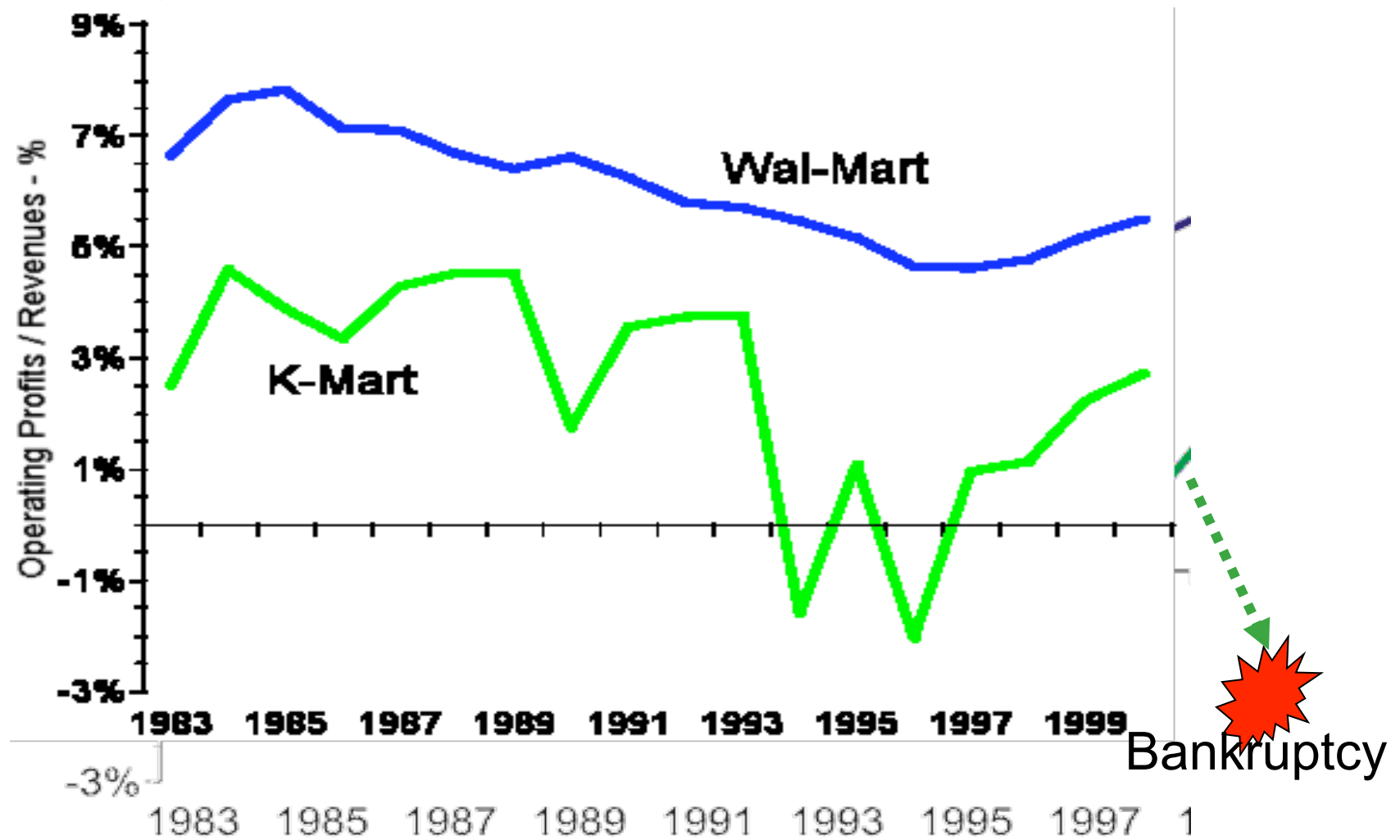
## GM Market Share Declined



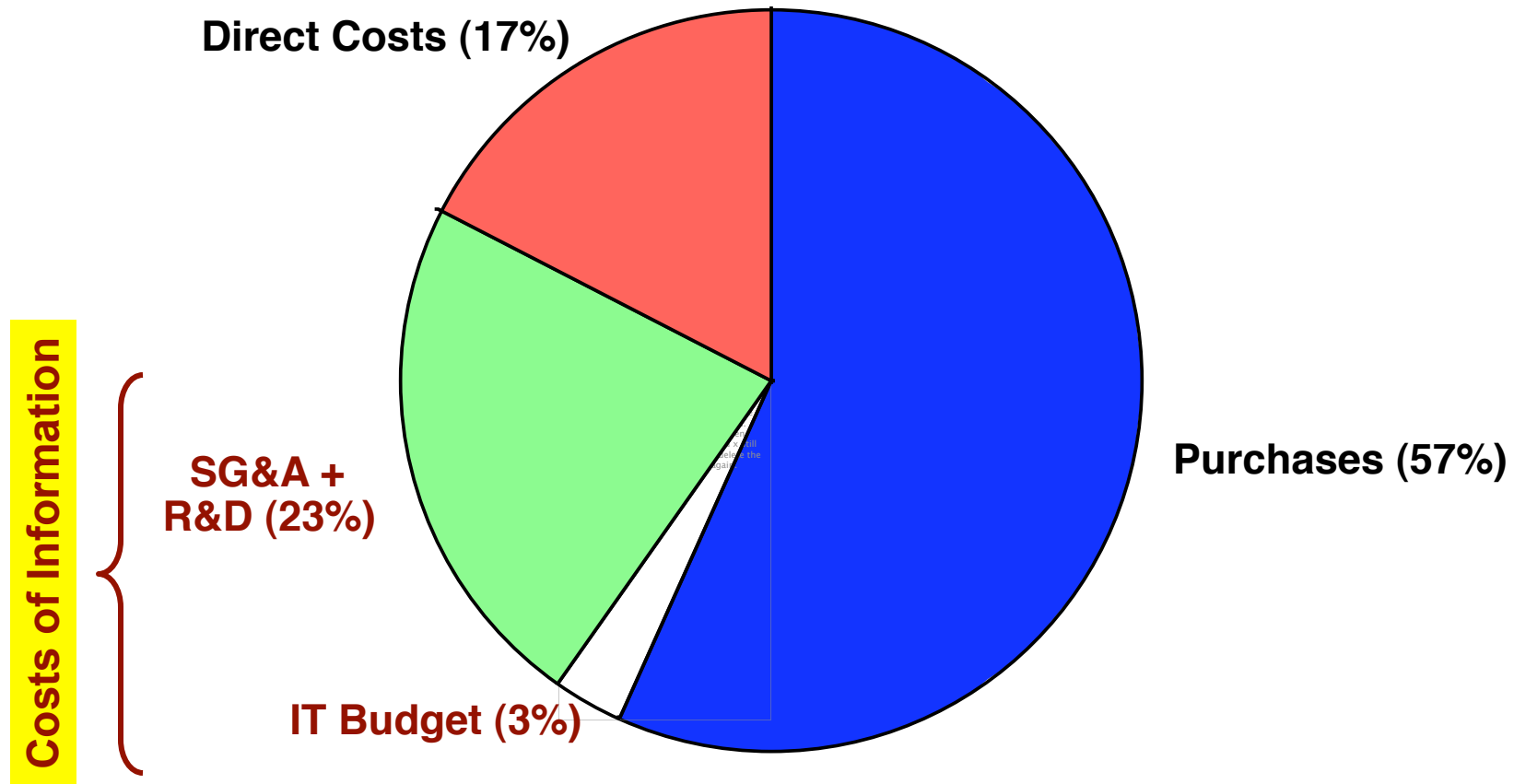
## Competition Among Firms with Different Transaction Costs



## Operating Results for Firms with Different Transaction Costs



## Never Confuse Information Management vs. Info Technology



## CIO Must Focus on Productivity of Information

$$\text{Information Productivity} = \frac{\text{Output}}{\text{Input}}$$

$$\text{Info. Productivity} = \frac{\text{Information Value}}{\text{Costs of Information}}$$

**SOURCE OF WEALTH**



® Information Productivity is a Registered Trademark of Strassmann, Inc.

# Fundamental Measure in an Information-Based Economy

**Information Value = Economic Value-Added (EVA)**



## Key Equations for Calculating Information Productivity

Economic Value-Added (EVA) =

Accounting Profit – Cost of Shareholder Capital



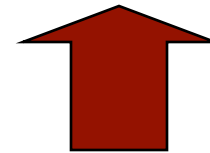
**Cost of Shareholder Capital =**

Cost of Capital \* Shareholder Equity

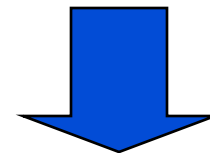
**Cost of Capital = Risk-Free Interest + Beta \* Risk Premium**

# How to Increase Information Productivity

**Increase Value-Creation by Information**



$$\text{Information Productivity}^{\circledR} = \frac{\text{Information Value-Added}}{\text{Information Costs}}$$



**Decrease Costs of Information**

## Productivity Assessment

# Productivity Case Study

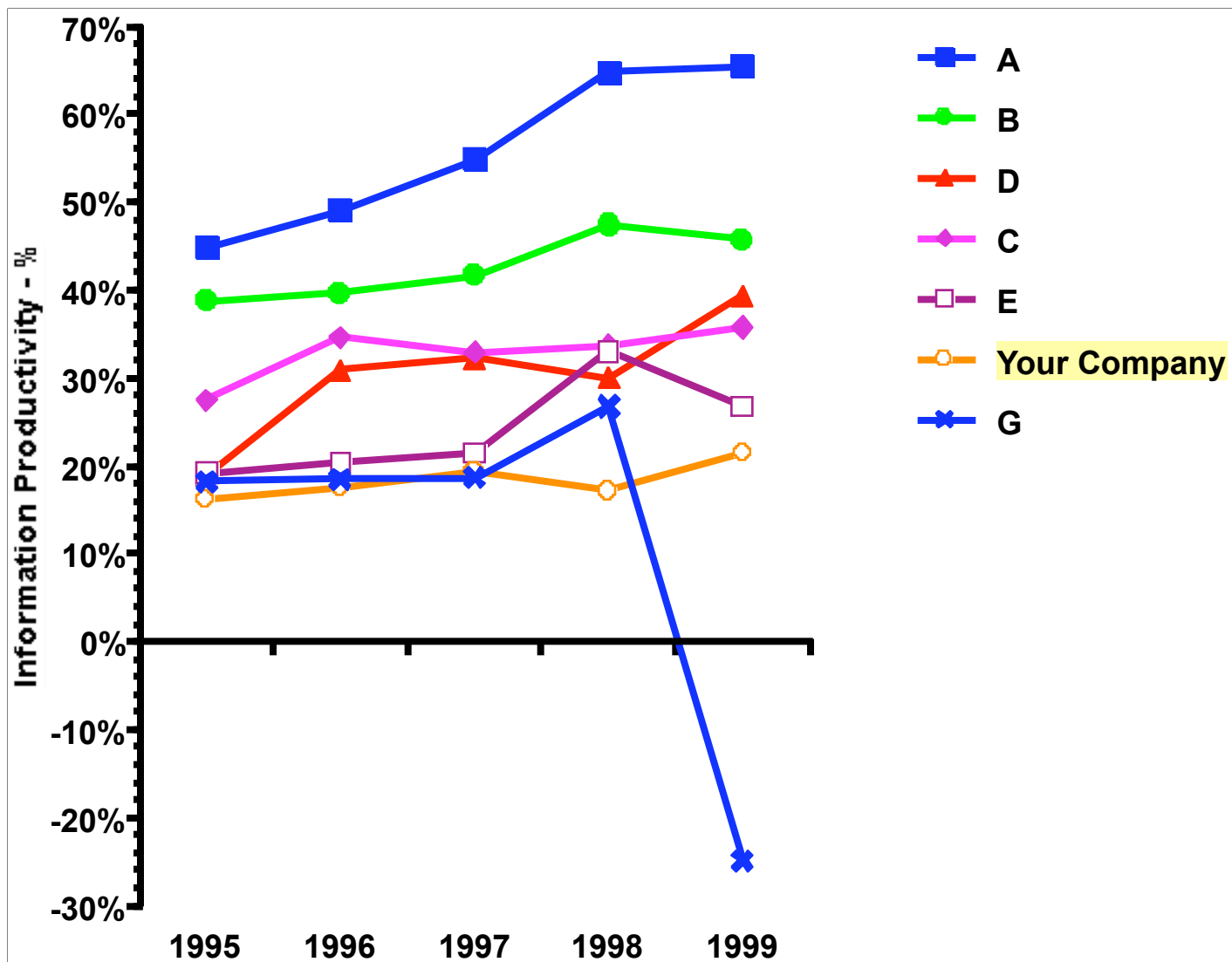
## Pick Look-Alike Firms for Making Productivity Comparisons

Company Name	Number of Employees - 1999
Competitor A	57,100
Competitor B	51,656
Competitor C	54,500
Competitor D	97,800
Competitor E	62,300
Competitors F	51,000
Your Company	26,500

## Calculate Information Productivity

Company Name - All data in 1999 \$Millions	Net Income	Cost of Capital - %	Net Financial Capital Employed	Costs of Information Management	Information Productivity
A	\$5,891	8.536	\$13,242	\$7,268	65.5%
B	\$2,446	8.08	\$7,428	\$4,035	45.7%
C	\$4,167	8.044	\$8,645	\$8,830	39.3%
D	\$2,110	8.842	\$5,165	\$4,625	35.7%
F	\$3,179	8.284	\$8,887	\$9,127	26.8%
Your Company	\$4,167	8.338	\$16,213	\$13,103	21.5%
G	\$-1,227	7.492	\$6,215	\$6,780	-25.0%

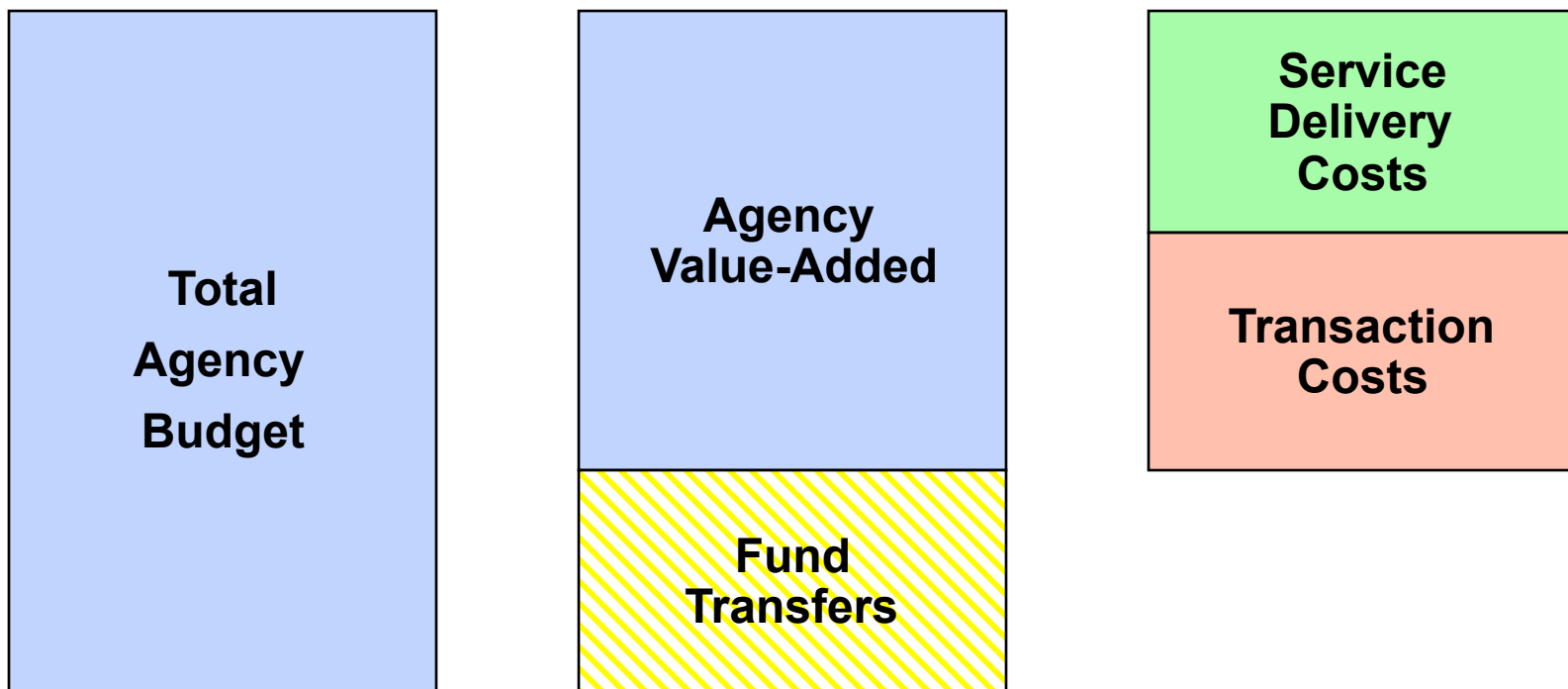
# Compare Historical Performance of Look-Alike Firms



# Productivity Assessment

## Case Study – Public Sector

## How to View Public Sector Costs





## Calculating Agency Information Productivity

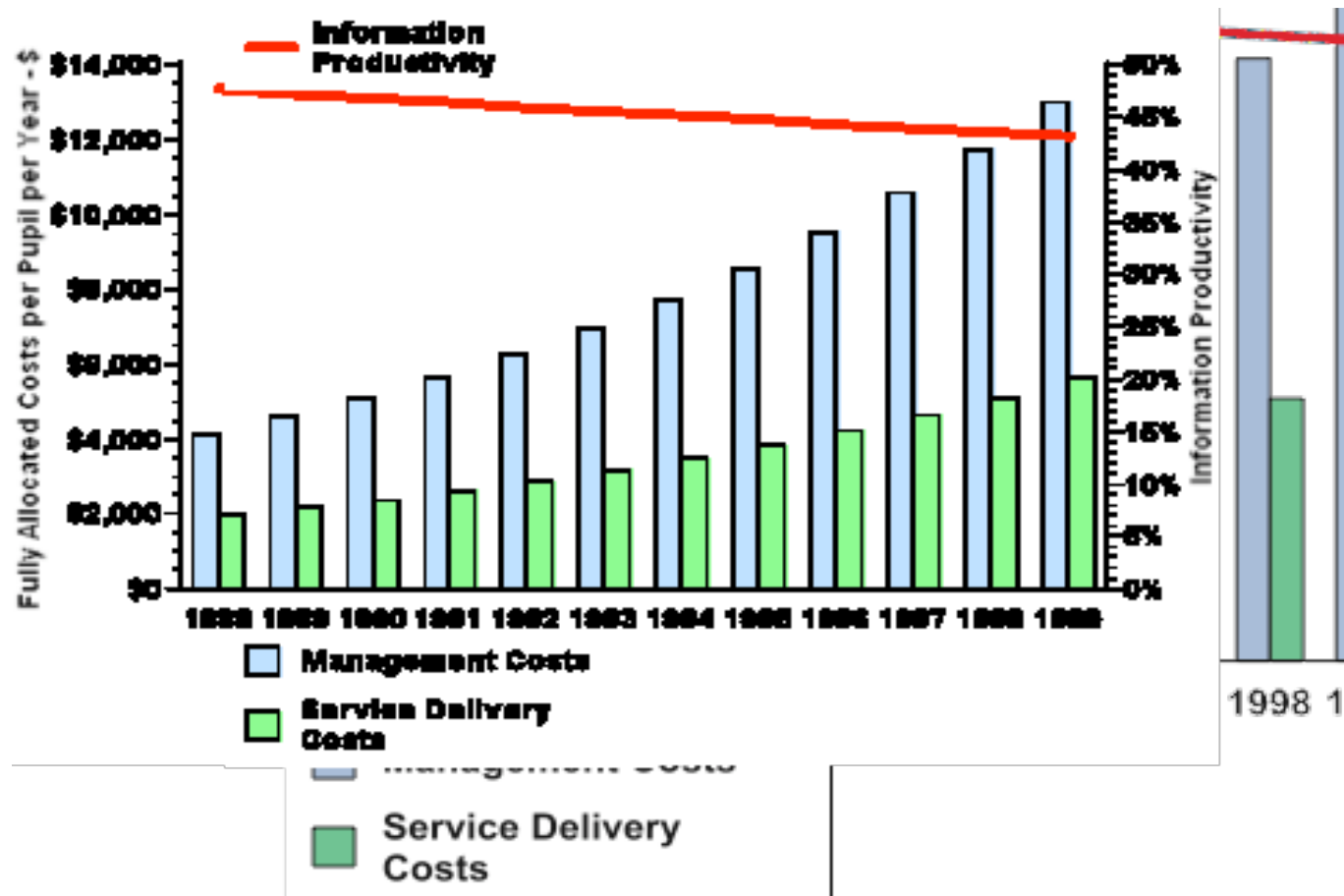
$$\text{Information Productivity} = \frac{\text{Service Delivery Costs}}{\text{Transaction Costs}}$$

Information Productivity of the New York City Board of Education:\*

$$\text{Information Productivity} = \frac{\$ 1,972^*}{\$ 4,135} = 48\%$$

\* SOURCE: Strassmann, P.A., The Business Value of Computers, 1990, p.91. In annual Costs per pupil, 1988-1989.

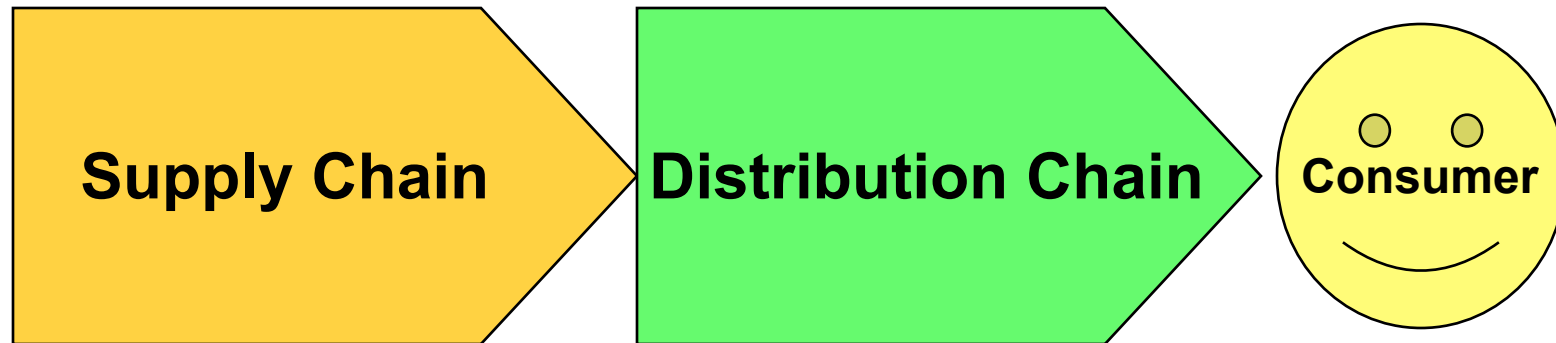
# Compare Costs and Productivity Trends in Public Sector



## Productivity Assessment

# Case Study – Value-Chain Productivity

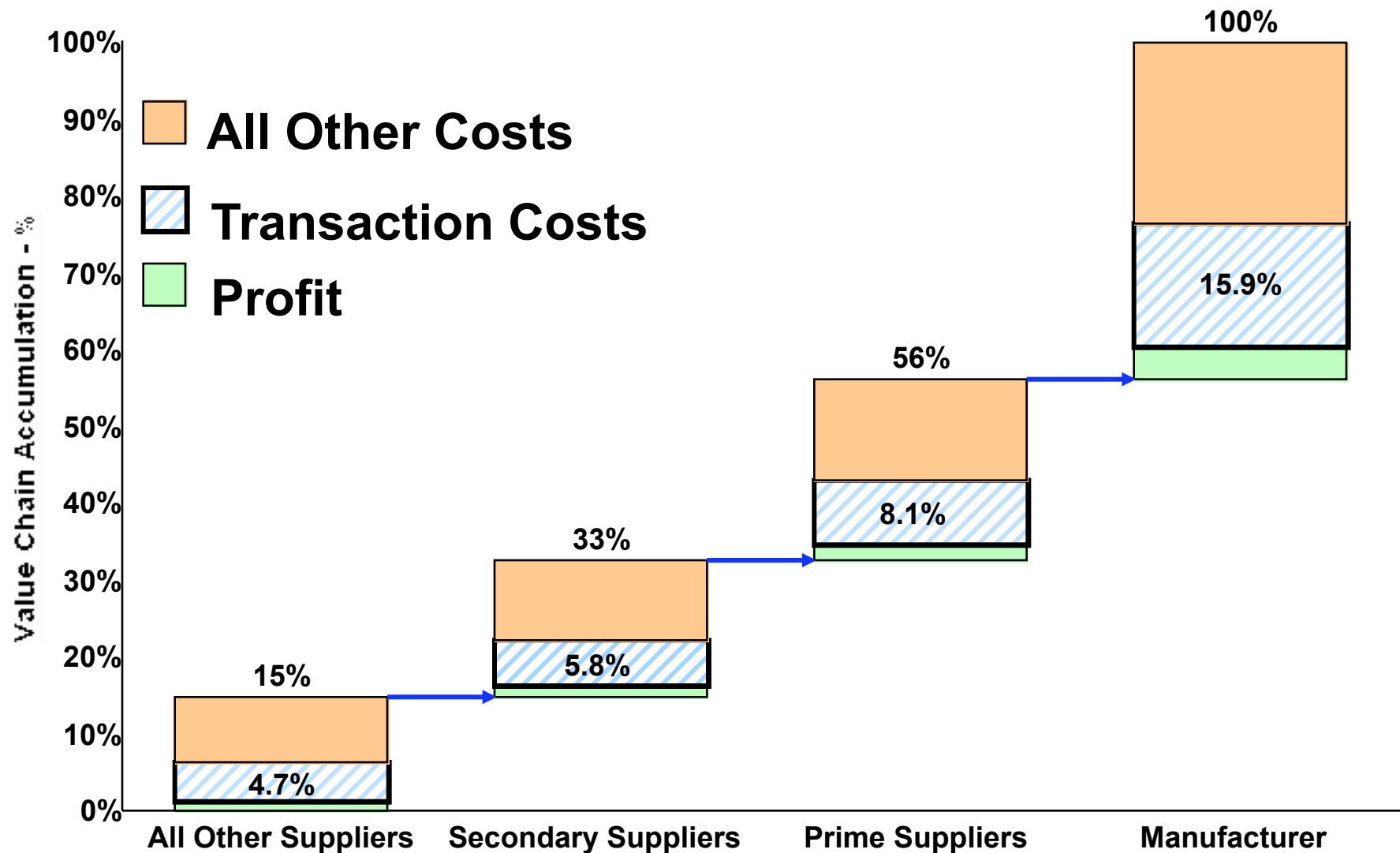
# The Real Problem: Transaction Costs in the Value Chain



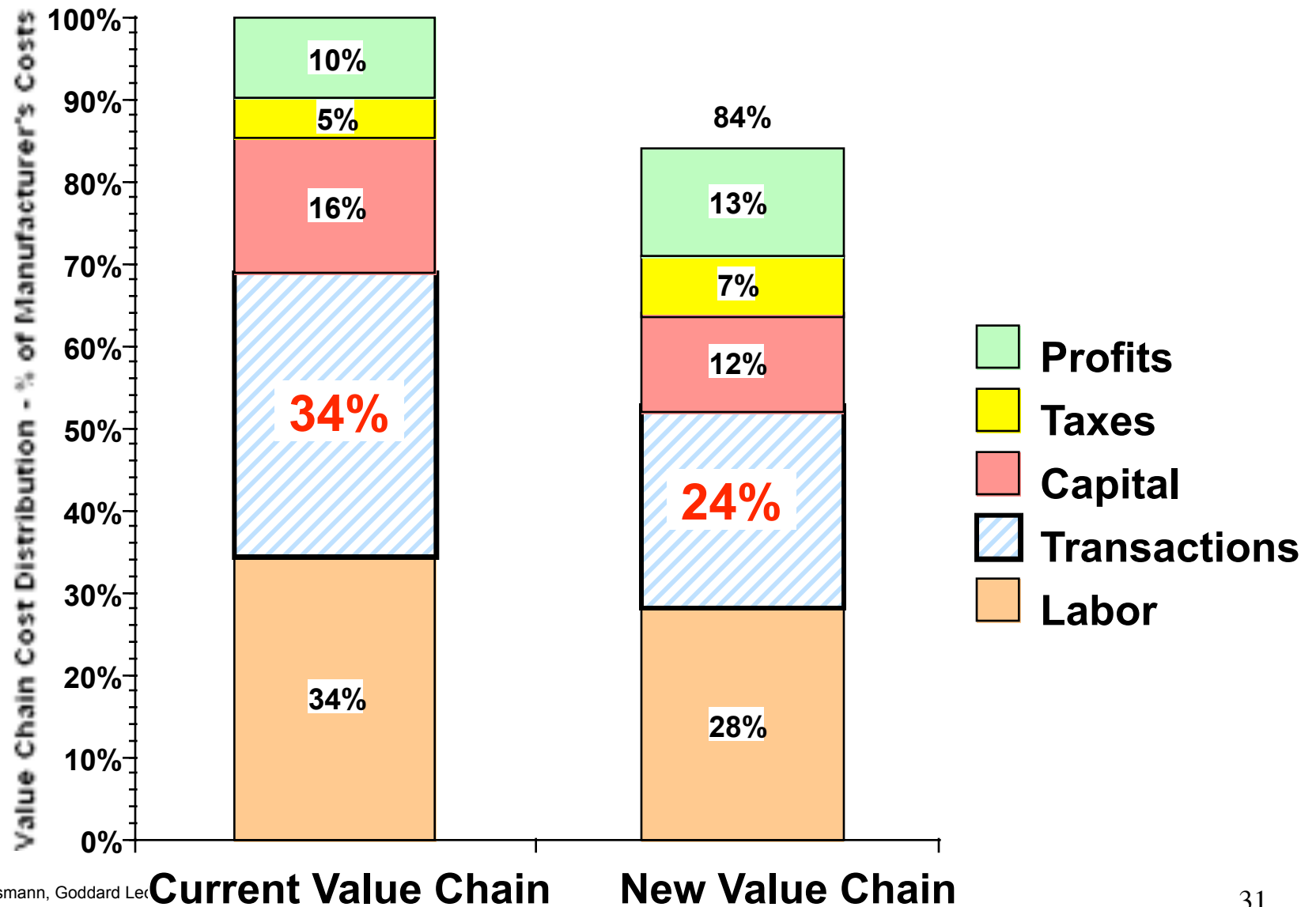
## Costs in a Supply Chain



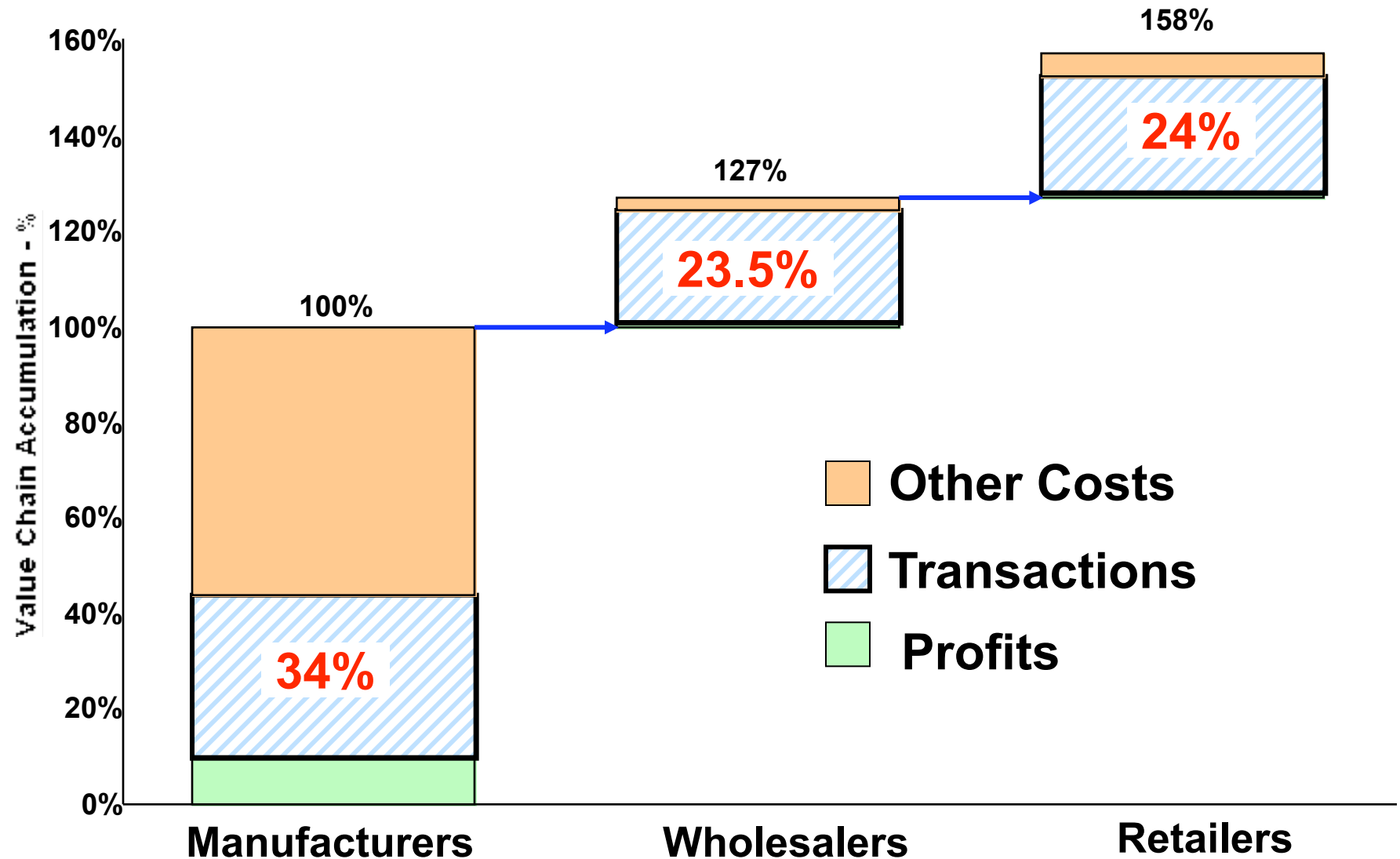
## Costs in a Supply Chain



# Potential Supply Chain Gains

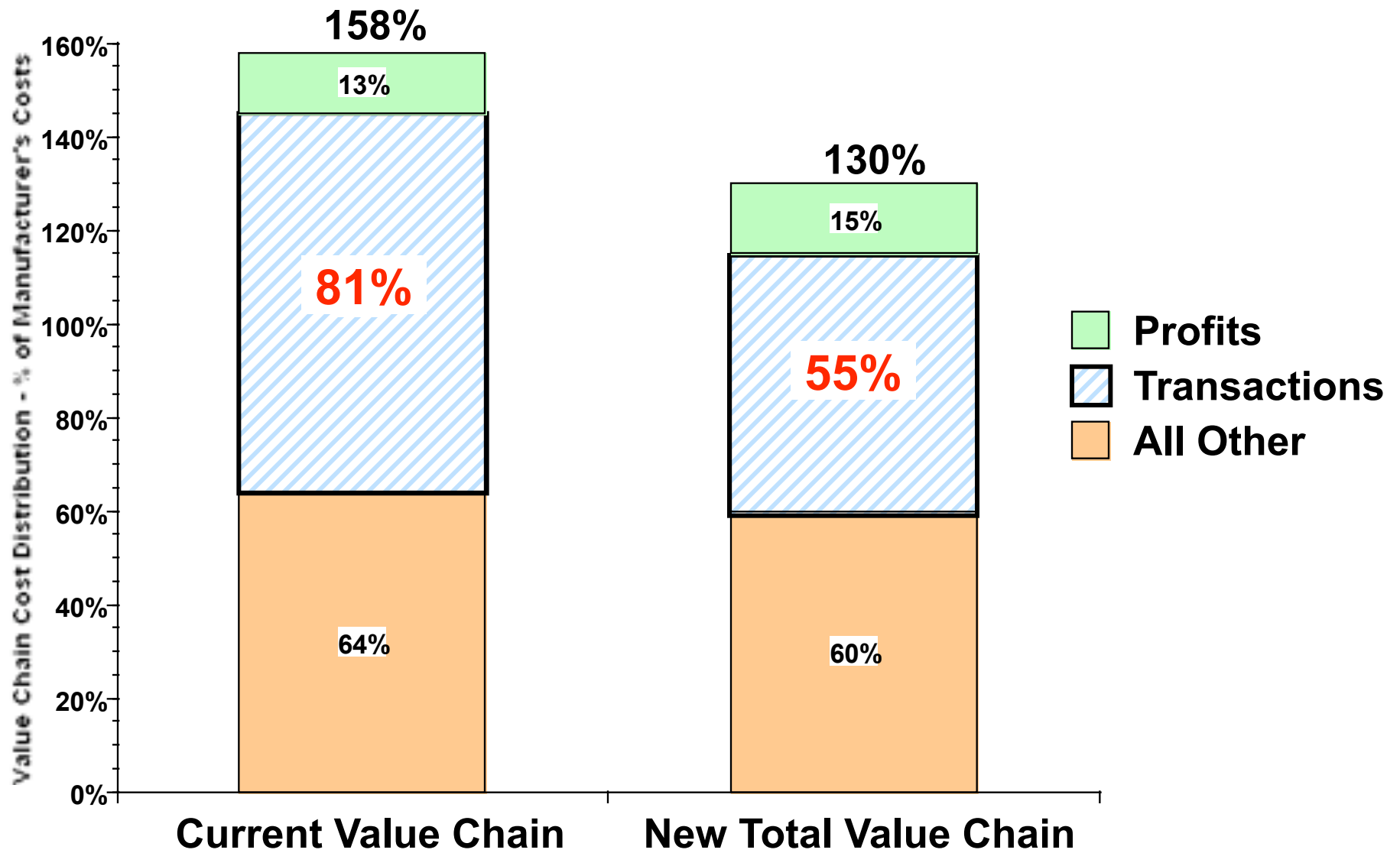


# The Total Value Chain





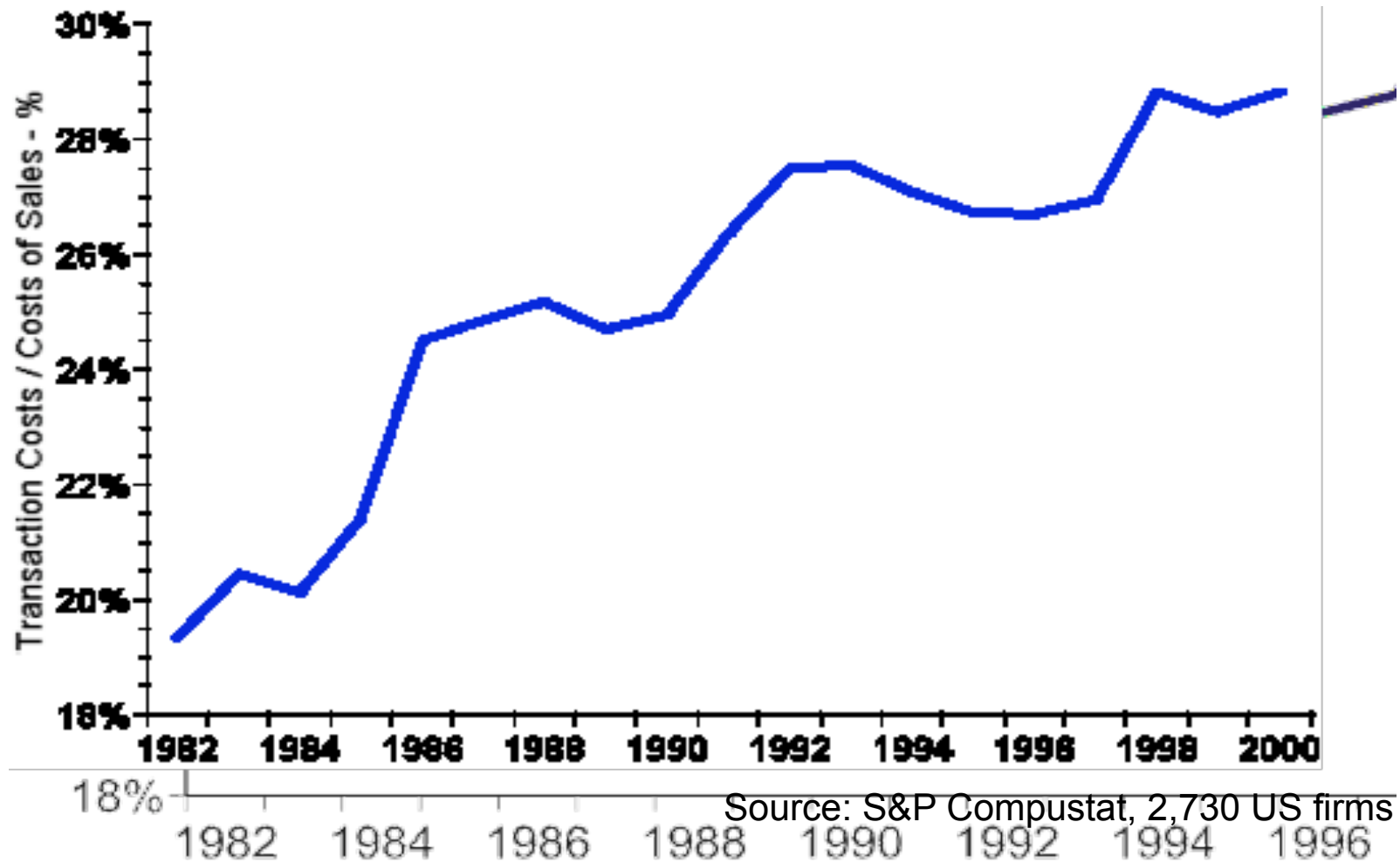
## Potential Total Gains



## Total Transaction Productivity for the Value Chain

	Cost of Goods	Transaction Costs	Transaction Productivity		
Corporate (Agency) Case	79%	16%	497%		
Supply Chain Case	34%	34%	100%		
Supply + Distribution Chain Case	64%	81%	79%		
Supply + Distribution Chain Case			64%		

## Information Technology Did not Cut Transaction Costs - USA



## Findings

- Accounting of total transaction costs is necessary for NASA to assess Agency productivity performance.
- Major gains in productivity possible primarily through re-structuring and disintermediation.

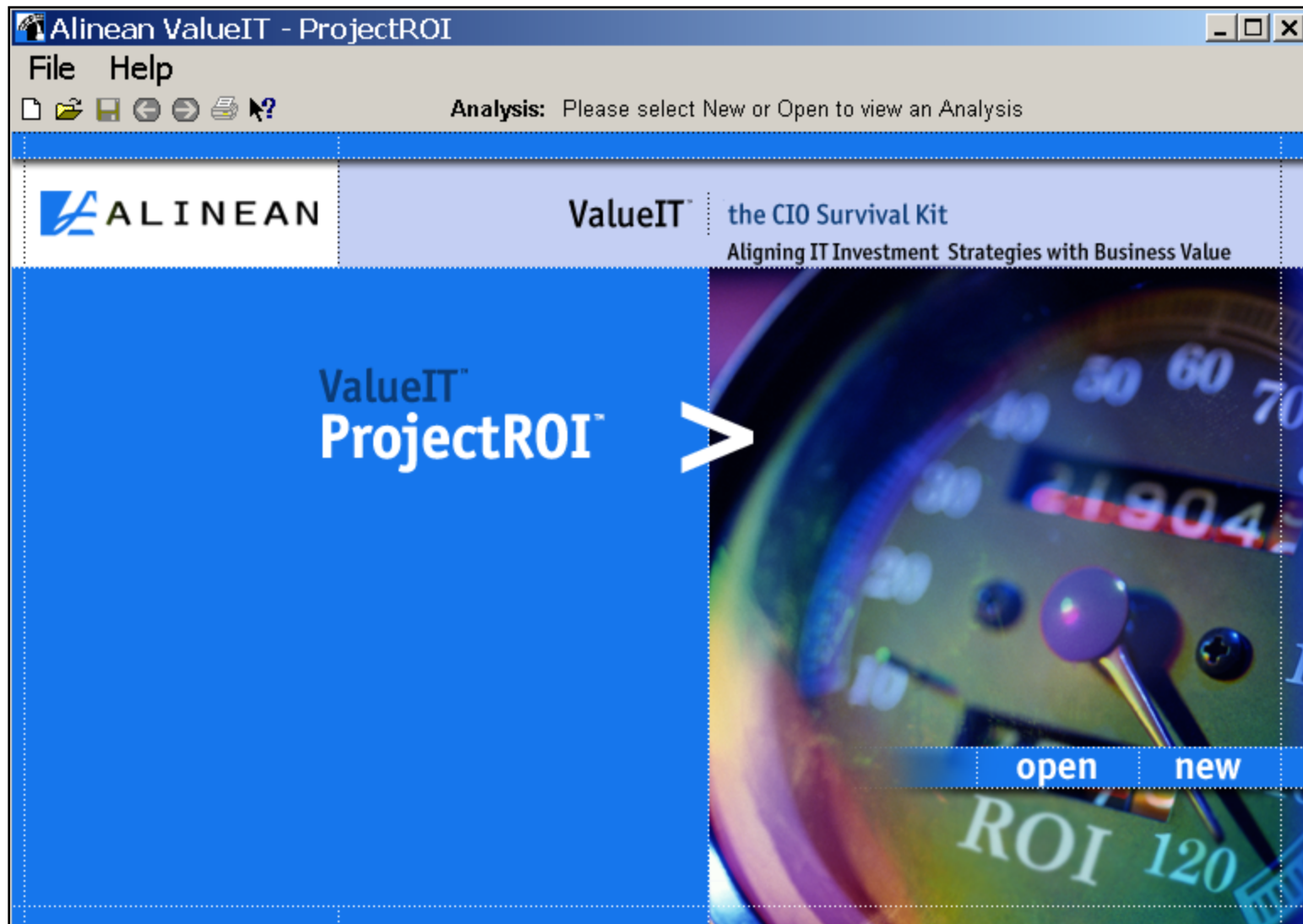
## Summary of the “Information Productivity Assessment”

- New metrics needed to assess information
- Information Productivity can be quantified
- Public sector Information Productivity measurements are feasible

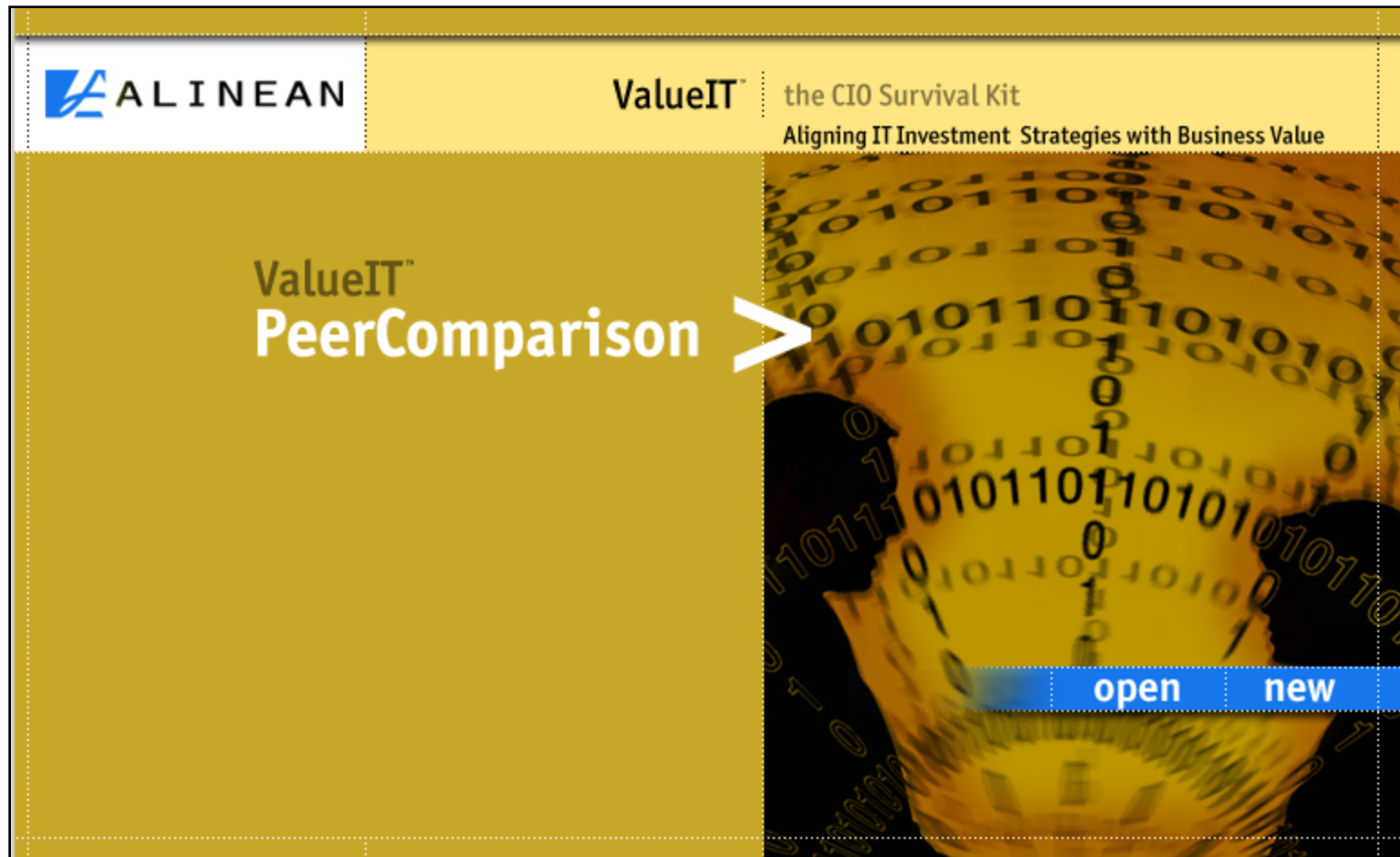
# ***Addendum***

Paul A. Strassmann, Alinean Corporation

*ValueIT Software Based on “The Business Value of Computers” and  
“Information Productivity” by P.A. Strassmann*



# ValueIT Includes Information Productivity Benchmarking





# Peer Group Selection Criteria for Benchmarking

File
Help

Analysis: Pharm Peer Comparison - 2002

ValueIT<sup>™</sup>  
**PeerComparison**

**Peer Group Selection**

Home

- Company Profile
  - Company
  - Financial Statements
  - Balance Sheet
  - Employee Profile
  - Prepared By
  - Prepared For
- Peer Group Selection
  - Group by SIC
  - Group by Selection Criteria
  - Peer Group Results**
- Information Productivity Assessment (CIO Report)
- IT Spending Assessment (CIO Report)

**Peer Group Results**

Please select up to 12 companies to include in the comparison.

Quick Pick
Unselect All

Company	Business (SIC Code)	Employees
<input checked="" type="checkbox"/> MERCK & CO	2834 - Pharmaceutical Prepa...	78,100
<input checked="" type="checkbox"/> BRISTOL MYERS SQUIBB	2834 - Pharmaceutical Prepa...	46,000
<input checked="" type="checkbox"/> LILLY (ELI) & CO	2834 - Pharmaceutical Prepa...	41,100
<input checked="" type="checkbox"/> PFIZER INC	2834 - Pharmaceutical Prepa...	90,000
<input type="checkbox"/> WYETH	2834 - Pharmaceutical Prepa...	52,289
<input type="checkbox"/> ASTRAZENECA PLC -SPON ADR	2834 - Pharmaceutical Prepa...	52,600
<input type="checkbox"/> GLAXOSMITHKLINE PLC -SP A...	2834 - Pharmaceutical Prepa...	107,470
<input checked="" type="checkbox"/> SCHERING-PLOUGH	2834 - Pharmaceutical Prepa...	29,800
<input type="checkbox"/> NOVARTIS AG -SPON ADR	2834 - Pharmaceutical Prepa...	71,116
<input checked="" type="checkbox"/> JOHNSON & JOHNSON	2834 - Pharmaceutical Prepa...	101,800
<input checked="" type="checkbox"/> ABBOTT LABORATORIES	2834 - Pharmaceutical Prepa...	71,426
<input type="checkbox"/> ROCHE HOLDINGS LTD -SP A...	2834 - Pharmaceutical Prepa...	63,717
<input type="checkbox"/> PHARMACIA CORP	2834 - Pharmaceutical Prepa...	59,600
<input type="checkbox"/> AVENTIS SA -ADR	2834 - Pharmaceutical Prepa...	91,729
<input type="checkbox"/> SCHERING AG -ADR	2834 - Pharmaceutical Prepa...	25,550

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# Information Productivity Assessments Calculated

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**PeerComparison**

**Home**  
**Company Profile**  
Company  
Financial Statements  
Balance Sheet  
Employee Profile  
Prepared By  
Prepared For  
**Peer Group Selection**  
Group by SIC  
Group by Selection Criteria  
Peer Group Results  
**Information Productivity Assessment (CF)**  
**Information Productivity Ranking**  
Information Productivity Graph  
Information Productivity Comparison  
Financial Metrics Comparison  
SG&A Comparison  
**IT Spending Assessment (CIO Report)**

**Information Productivity Assessment**  

The Information Productivity Ranking stack ranks the company being analyzed and the peers according to their Information Productivity Ratio. This ratio is equal to EVA divided by Information Management (Info Mgmt).

Company	Info Mgmt (SG&A) (000,000s)	EVA (000,000s)	Information Productivity
MERCK & CO	\$8,680.80	\$5,564.44	64.1%
BRISTOL MYERS SQUIBB	\$7,595.00	\$4,160.66	54.8%
LILLY (ELI) & CO	\$5,652.50	\$2,112.22	37.4%
PFIZER INC	\$16,146.00	\$5,885.53	36.5%
COMPANY XYZ	\$3,845.20	\$1,376.57	35.8%
SCHERING-PLOUGH	\$4,796.00	\$1,130.75	23.6%
JOHNSON & JOHNSON	\$15,583.00	\$3,147.77	20.2%
ABBOTT LABORATORIES	\$5,296.73	\$744.10	14.0%
<b>Average</b>	<b>\$8,449.40</b>	<b>\$3,015.26</b>	<b>35.8%</b>

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# A Wide Range of Peer Comparisons Feasible

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PeerComparison

- Group by Selection Criteria
- Peer Group Results
- Information Productivity Assessment**
  - Information Productivity Ranking
  - Information Productivity Graph
  - Information Productivity Comparison
  - Financial Metrics Comparison
  - SG&A Comparison**
- IT Spending Assessment (CIO Report)
  - IT Spending Profile
  - IT Spending Overview
  - IT Spending Chart
  - IT Spending Comparison
  - IT Spending Graph
  - IT Spending / Revenue Graph
  - Workforce IT Spending
  - IT Spending / Emp Graph
  - IT Spending / Info. Worker Graph
  - IT Innovation
  - IT Innovation Graph
  - IT Budget Allocation
  - IT Budget Comparison
  - IT Budget Graph

Information Productivity Assessment

Sales, General and Administrative Expenses are a key in calculating Information Productivity, and a key financial performance indicator of company performance when compared to other financial metrics such as revenue, employees and assets.

Company	SG&A / COGS	SG&A / Net Assets	SG&A / Revenue	SG&A / Employee
MERCK & CO	31.1%	19.7%	18.2%	\$111.15
BRISTOL MYERS SQUIBB	158.4%	28.1%	39.1%	\$165.11
LILLY (ELI) & CO	331.5%	34.4%	49.0%	\$137.53
PFIZER INC	394.9%	41.2%	50.3%	\$179.40
COMPANY XYZ	75.2%	26.9%	30.2%	\$67.72
SCHERING-PLOUGH	267.2%	39.4%	48.9%	\$160.94
JOHNSON & JOHNSON	196.5%	40.5%	47.2%	\$153.07
ABBOTT LABORATORIES	84.3%	22.7%	32.5%	\$74.16
<b>Average</b>	<b>192.4%</b>	<b>31.6%</b>	<b>39.4%</b>	<b>\$131.13</b>

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